Commercial aircraft at gate

1. Introduction

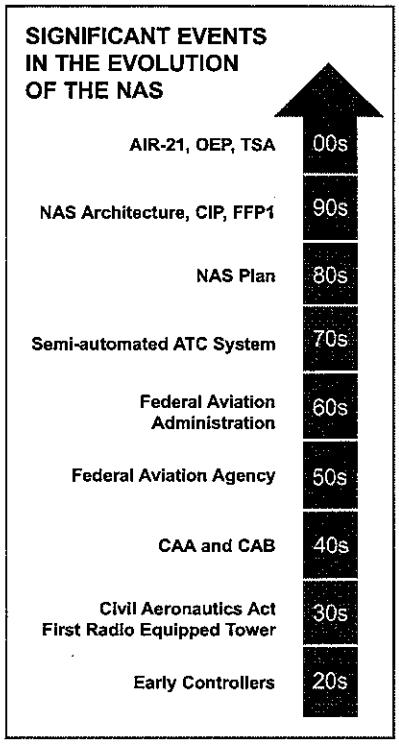
America's aviation industry is soaring into the 21st century with projected increases in business, recreation, and personal travel. According to the *Federal Aviation Administration (FAA) Aerospace Forecasts 2002-2013* 💻, released in March 2002, domestic operations (e.g., takeoffs or landings) are expected to increase from over 66 million in 2001 to more than 81 million in 2013.

While recent tragic events have curtailed short-term growth in the aviation industry, all indications strongly suggest that growth will resume by 2004. The National Airspace System (NAS) must be modernized via a coordinated, long-term plan to support increasing air traffic.

"New and revolutionary technologies hold undeniable and exciting possibilities for flight and safety, and keeping pace with advanced technology is the key."

Norman Y. Mineta,
Secretary
U.S. Department of Transportation

History of Air Traffic Control (ATC)



Air Traffic Control (ATC) began in the U.S. in the late 1920s, pioneered by airport employees like Archie League and William "Whitey" Conrad. Early controllers used flags and lights to signal their instructions to pilots. In 1930, Cleveland became the first city to boast a radio-equipped control tower.

As traffic increased, the need to ensure separation of flights moving between cities grew. Encouraged by the Federal government, an airline consortium established the first three centers for this purpose between December 1935 and June 1936. The Bureau of Air Commerce, within the Department of Commerce (DOC), took over operation of the three facilities when it assumed responsibility for En Route ATC in July 1936. Pioneer air traffic controllers used maps, blackboards, and mental calculations to ensure the safe separation of aircraft traveling between cities along designated routes.

In 1938, the Civil Aeronautics Act transferred Federal civil aviation responsibilities from the DOC to a new independent agency, the Civil Aeronautics Authority. In 1940, President Franklin Roosevelt split the Authority into two agencies, the Civil Aeronautics Administration (CAA) and the Civil Aeronautics Board (CAB) and placed them under the DOC. The CAA was responsible for ATC, airman and aircraft certification, safety enforcement, and airway development. The CAB was entrusted with safety rulemaking, accident investigation, and economic regulation of the airlines. On the eve of America's entry into World War II, the Federal government also began to assume operation of major airport towers, a responsibility that became permanent in the postwar era.

The introduction of jet airliners and a series of midair collisions spurred passage of the Federal Aviation Act of 1958. This legislation transferred CAA functions to a new independent body, the Federal Aviation Agency. The agency was given sole responsibility to develop and maintain a common civil-military system of air navigation and ATC. The Act also transferred safety rulemaking from the CAB to the Federal Aviation Agency. On April 1, 1967, the Federal Aviation Agency became one of several organizations within the Department of Transportation (DOT) and became the Federal Aviation Administration (FAA).

By the mid-1970s, the FAA achieved a semi-automated ATC system based on a combination of radar and computer technology. By automating certain routine tasks, the system allowed controllers to concentrate more efficiently on the vital task of aircraft separation. Data appearing directly on the controllers' scopes provided the identity, altitude, and groundspeed of aircraft carrying radar beacons. Despite its effectiveness, this system required enhancement to keep pace with increasing air traffic.

To meet this traffic growth challenge, the FAA unveiled the NAS Plan in January 1982. This plan called for more advanced systems for En Route and Terminal ATC, modernized flight service stations, and improvements in ground-to-air surveillance and communication.

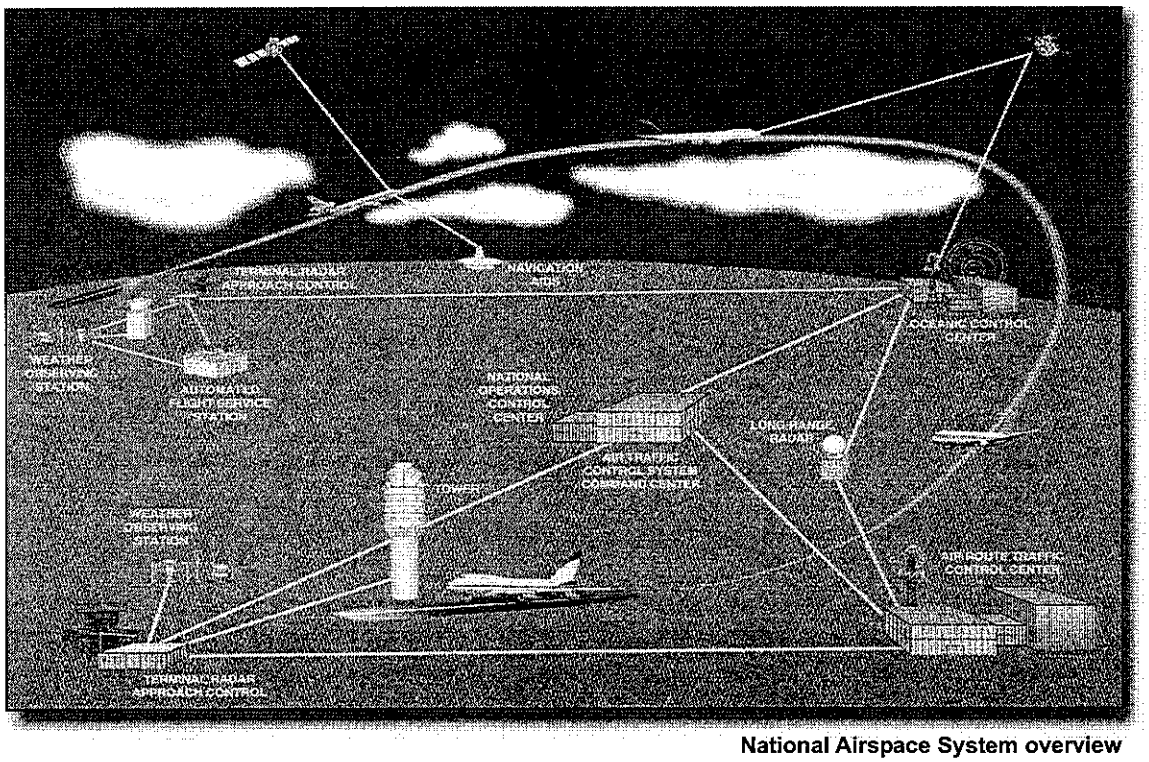
In February 1991, the FAA replaced the NAS Plan with the more comprehensive *National Airspace System Capital Investment Plan* (CIP). This plan included higher levels of automation as well as new radar, communications, and weather systems. In September 1995, the *NAS Architecture Version 1.0*, the plan for NAS modernization and evolution, was released. In January 1999, the *National Airspace System Architecture Version 4.0* was approved by the Administrator of the FAA.

The Administrator established the Free Flight Phase 1 (FFP1) program in October 1998 as the single voice and point-of-contact for a fast-paced modernization effort. FFP1 was the consensus vehicle by which the FAA, with ongoing industry collaboration, would deploy certain low-risk capabilities to selected sites to provide early, measurable benefits to system users.

Legislation in 2000 prompted action to establish a new performance-based organization within the agency with responsibility for air traffic services. Additionally, the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21) was passed. These pieces of legislation were enacted to improve aviation safety, create airline competition, and provide taxpayers with a healthy return on aviation investments.

In 2001, the FAA put in place the *Operational Evolution Plan* (OEP). The OEP represents the FAA commitment to meet the air transportation needs of the U.S. for the next 10 years by increasing capacity, decreasing delays, and continuing to improve safety and security. Developed in concert with the entire aviation community, the OEP addresses four core areas: Arrival and Departure Rate (AD), En Route Congestion (ER), Airport Weather (AW), and En Route Severe Weather (EW).

Following the events of September 11, 2001, Congress created the Transportation Security Administration (TSA), which succeeds the FAA as the agency with primary responsibility for civil aviation security.



National Airspace System overview

The National Airspace System (NAS)

Today's NAS is comprised of a complex network of interconnected systems as well as the people who operate, maintain, and use the systems and detailed procedures and certifications. The NAS includes more than 19,000 airports, 750 ATC facilities, and about 45,000 pieces of equipment that operate unceasingly to provide safe and efficient flight services for users.

The NAS spans the country, extends into the Atlantic, Pacific, and Arctic oceans, and interfaces with neighboring ATC systems for international flights. The NAS supports air transportation commerce that constitutes approximately six percent of the nation's gross domestic product.

Document Scope

This publication provides an overview of the current NAS Architecture as contained in the NAS Architecture Database and an update to the modernization efforts described in the January 1999 *Blueprint for NAS Modernization*.

"The updated National Airspace System Blueprint represents a milestone in the development of aviation. It comes at a significant time of new demands, new growth that we will nurture with cooperation, planning, commitment, and vision."

Charles E. Keegan,
Associate Administrator
Research and Acquisitions